

# Processing Flow

# **At the end of this Session, you will be able to:**

- **List the products that you need to begin processing a contract**
- **Explain why we need to reformat our data**
- **List each of the stages of the processing flow**
- **Describe where in the processing flow each stage occurs**

# Data Processing Overview

The objectives of data processing may be summarised as

:

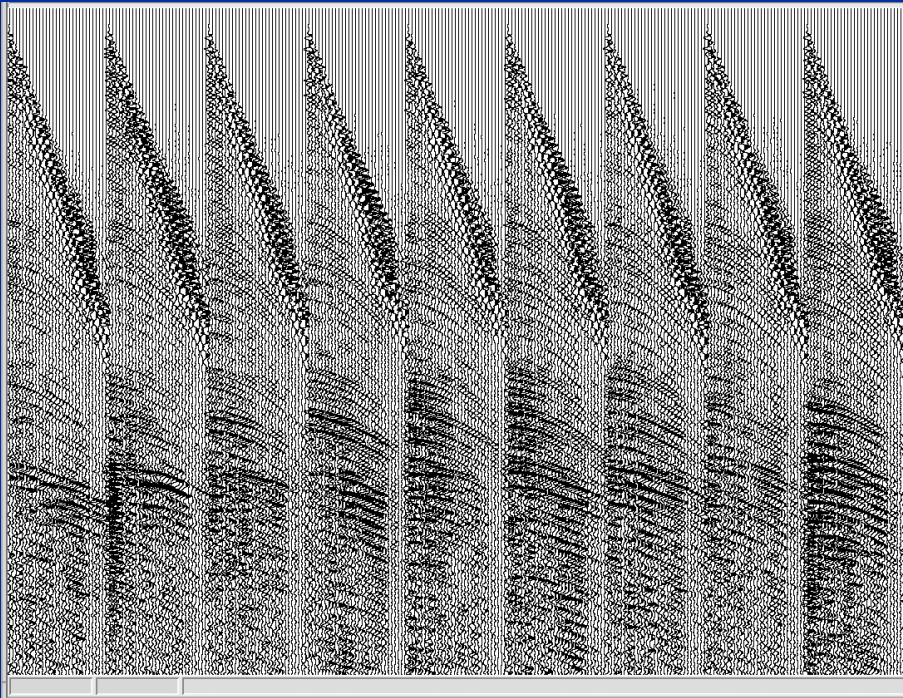
**To produce seismic cross-section representative of geology**

**To enhance the signal and reject the noise**

**To meet the exploration objectives of the client**

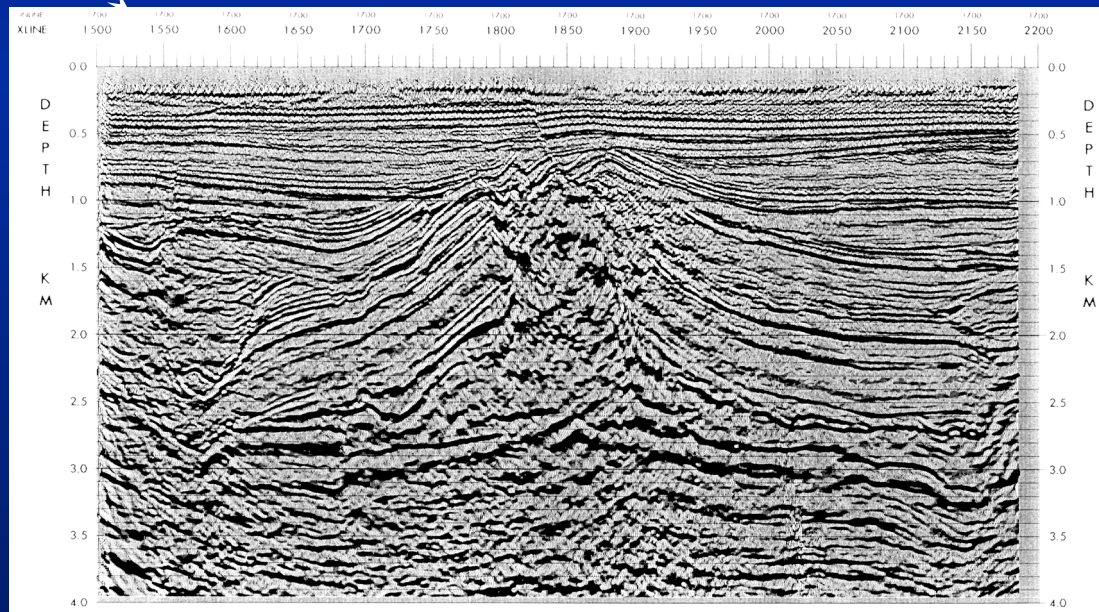
# The Sequence of Events

Raw shot records



What do we start with in Data Processing?

Final migrated section



How do we get here?

# Data Processing - In the beginning....

Data processing will usually commence with the receipt of the following (or part thereof) :

- **Tape containing recorded seismic data (trace sequential or multiplexed)**
- **Observer logs/reports**
- **Field Geophysicist logs/reports and listings**
- **Navigation/survey data**
- **Field Q.C. displays**
- **Contractual requirements**

# Data Processing - What next?

Before any serious processing can take place, we need to:

- **Perform inventory check**
- **Project set-up - resource allocation etc**
- **Client meeting - determine objectives etc**
- **Produce testing plan**
- **Reformat and QC display of selected data**

# Why Reformat?

**'Data Format' defines -**

**How the data is arranged and stored.**

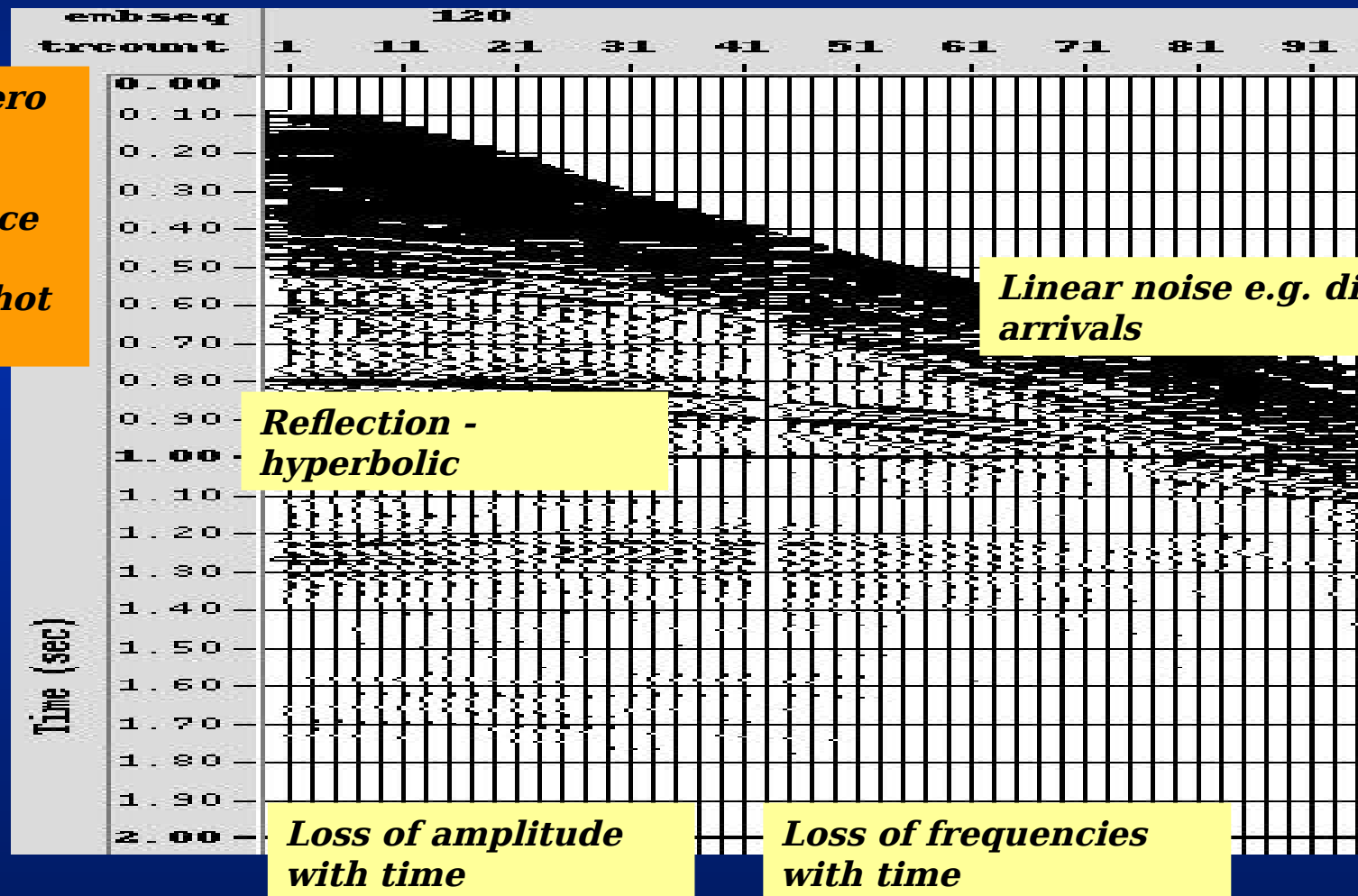
**This will usually follow an Industry standard convention.**

**e.g. SEGD, SEG-Y for magnetic media**

**Data from the field will not usually be in the format required by the processing software.**

# Data Processing - raw shot data

Data corresponding to one shot (located somewhere on the earth) which was recorded into 96 (only data from 1-93 shown on plot) different receivers (also located somewhere on earth!)





Where are the shots  
and receivers located ?



# Processing Sequence

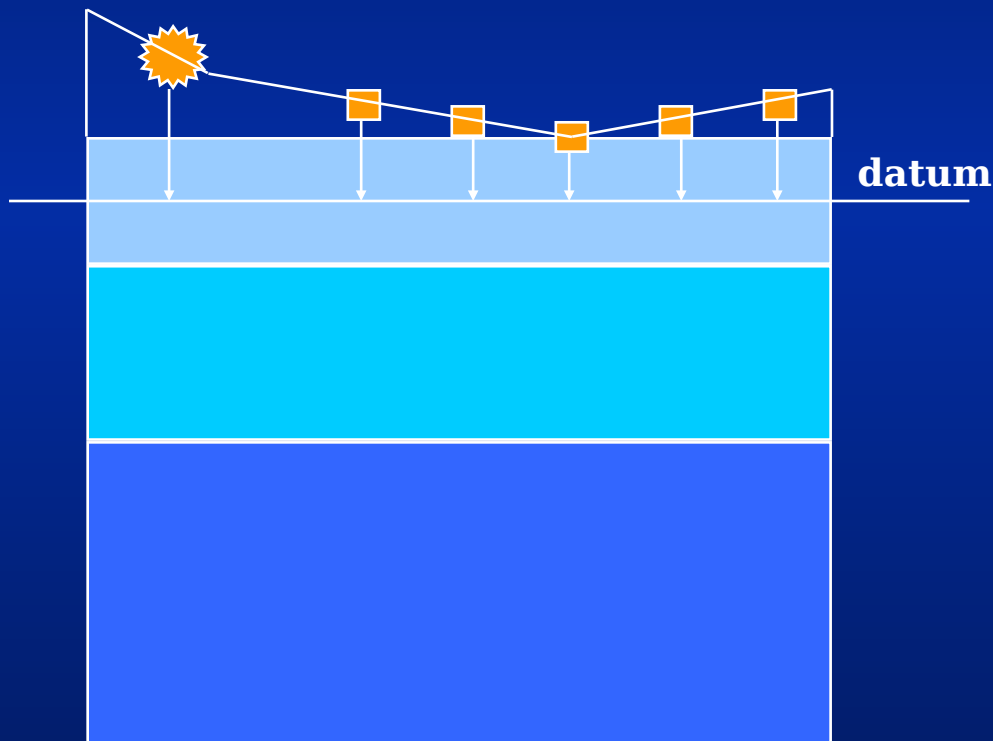
## Geometry definition

The most important values for data processing are relative **OFFSETS!**

These may be Source - Receiver offsets,  
Receiver - Receiver offsets etc

# Processing Sequence

What if the surface elevation changes ?

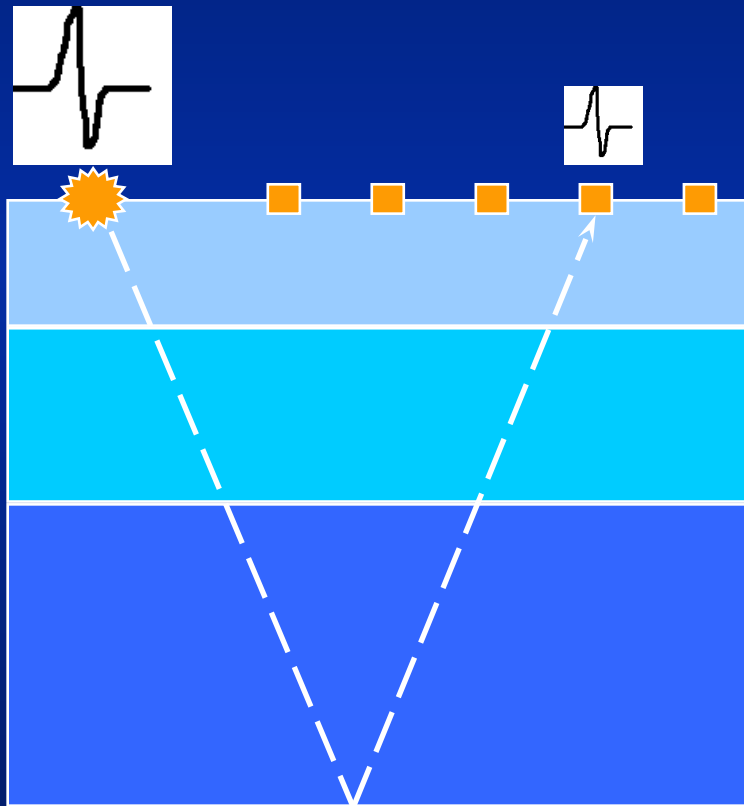


Geometry definition

**Static corrections**

i.e. remove the difference in travel time caused by shots and receivers being at different elevations - **change our time-zero ref. point to simulate the re-positioning of shots and receivers**

Where's all the source energy gone ?



## Processing Sequence

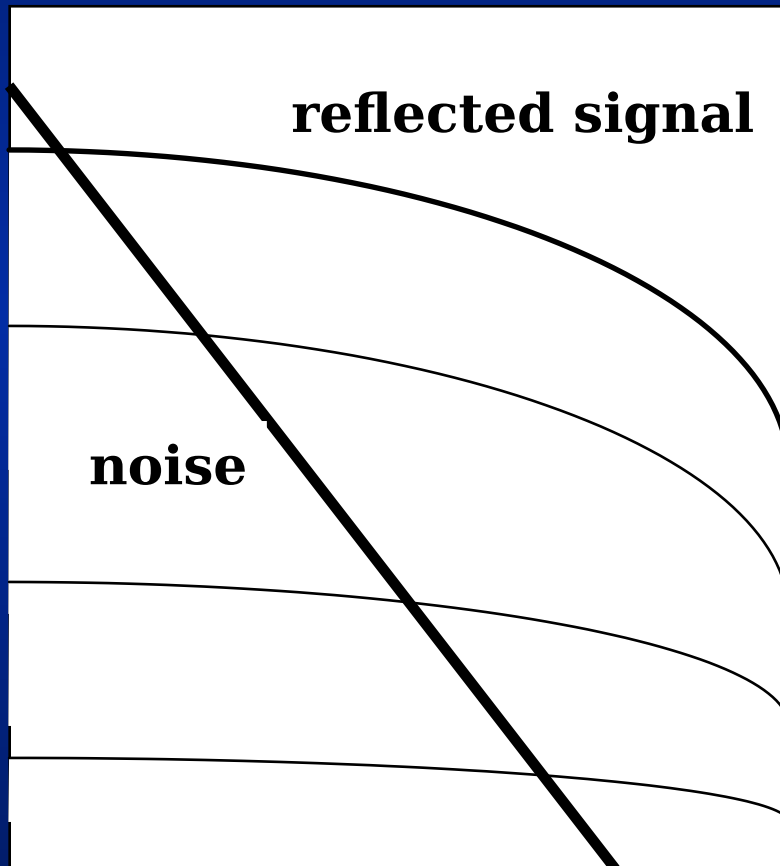
Geometry definition

Static corrections

**Amplitude recovery**

Geometric spreading, absorption etc

How to remove  
coherent noise?



## Processing Sequence

Geometry definition

Static corrections

Amplitude recovery

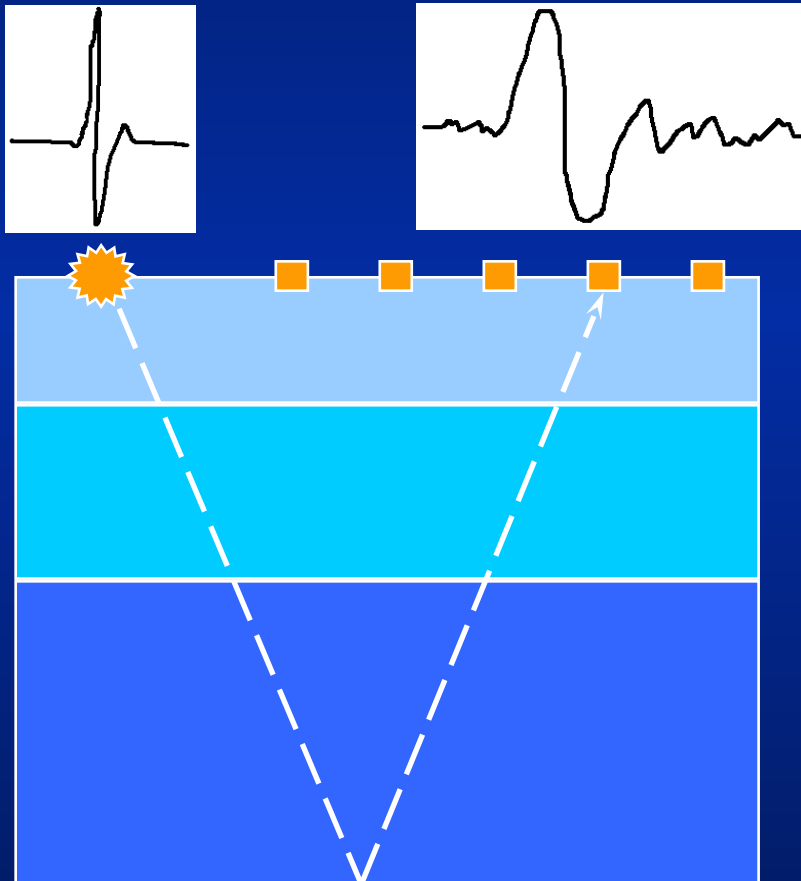
**Velocity filtering**

What about random noise?

- K-filter? Bandpass filter?

May leave until stacking process!

How to improve the  
vertical resolution?



# Processing Sequence

**Geometry definition**

**Static corrections**

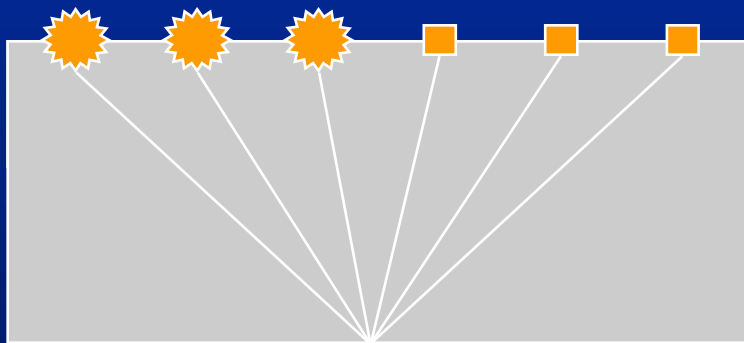
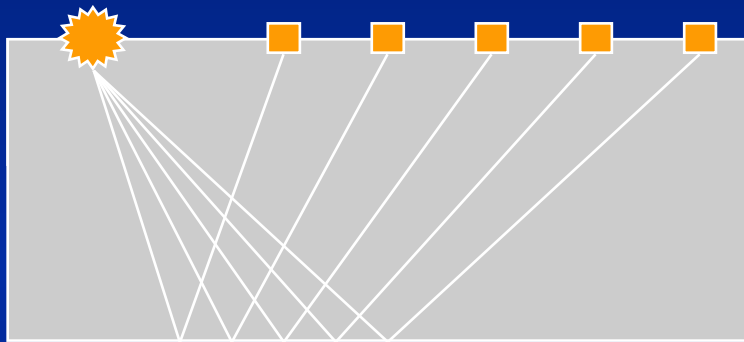
**Amplitude recovery**

**Velocity filtering**

**Deconvolution**

Compensate for the filtering  
effects of the earth etc

How to order the data?



# Processing Sequence

**Geometry definition**

**Static corrections**

**Amplitude recovery**

**Velocity filtering**

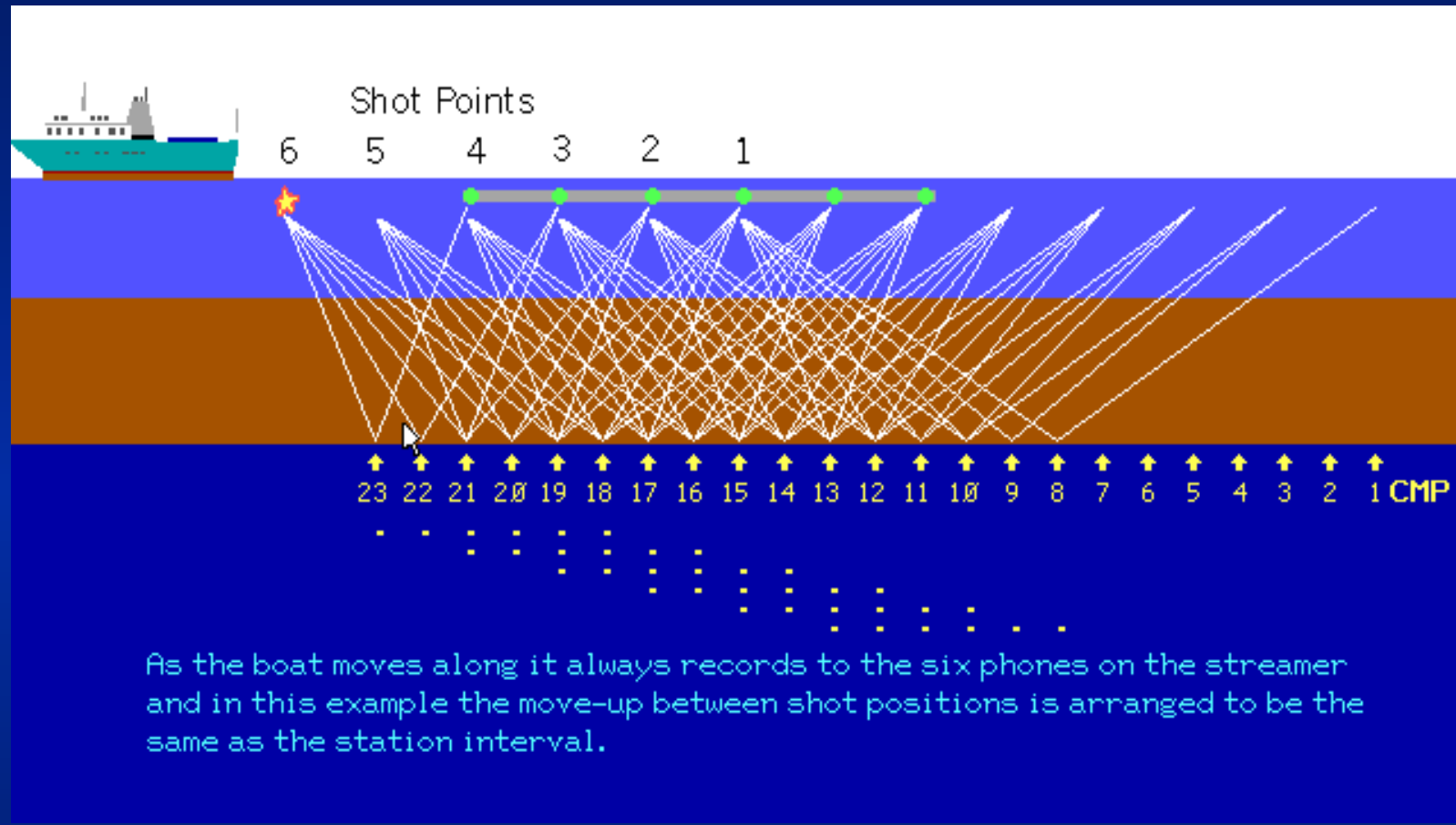
**Deconvolution**

**CMP gather**

Some processes must be carried out in the CMP domain

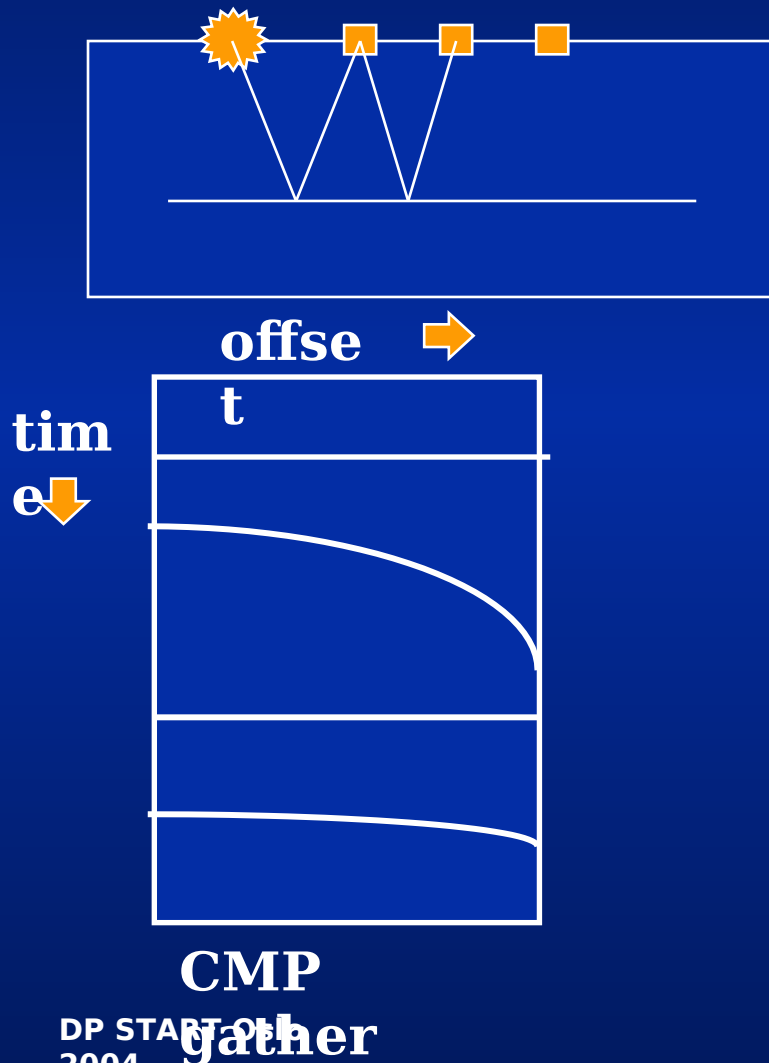
'Multiple Coverage' Acquisition techniques

# Multiple Coverage



formation about any single point within the earth is recorded several times using the Multiple Coverage technique

How to remove false reflections?



## Processing Sequence

Geometry definition

Static corrections

Amplitude recovery

Velocity filtering

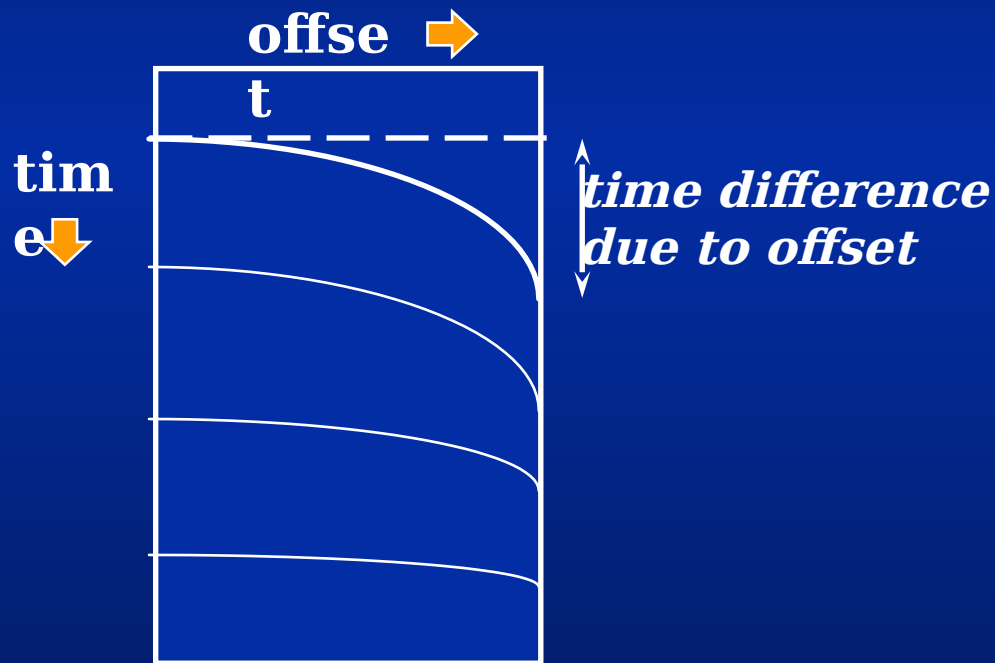
Deconvolution

CMP gather

**Demultiple**



How to correct for time differences due to offset within the CMP?



CMP  
gather

## Processing Sequence

Geometry definition

Static corrections

Amplitude recovery

Velocity filtering

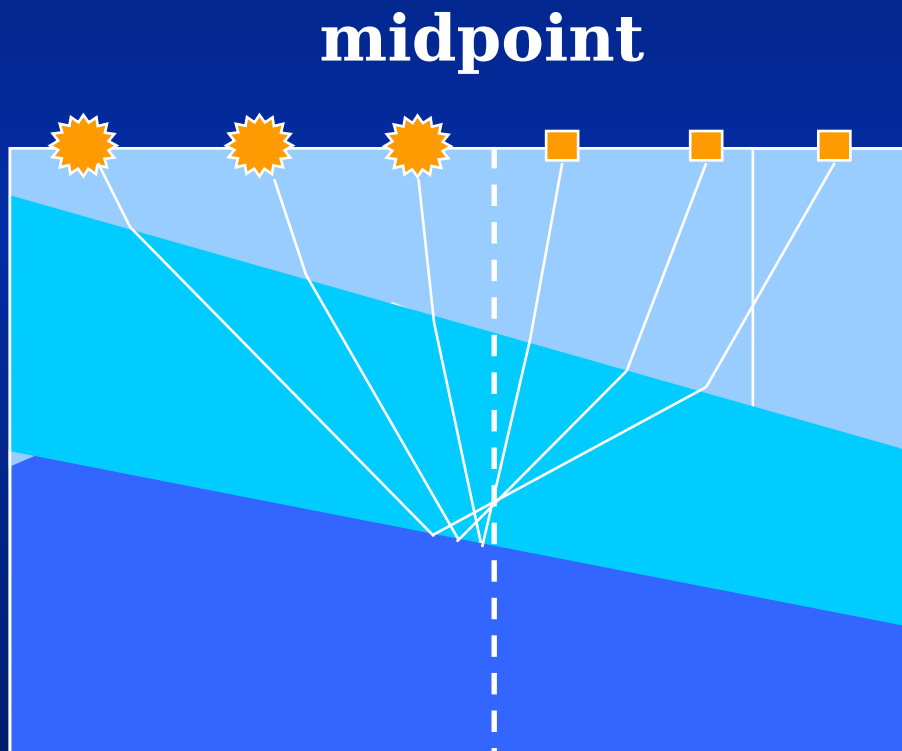
Deconvolution

CMP gather

Demultiple

**NMO correction**

Do the reflections all  
come from a single  
point?



## Processing Sequence

Geometry definition

Static corrections

Amplitude recovery

Velocity filtering

Deconvolution

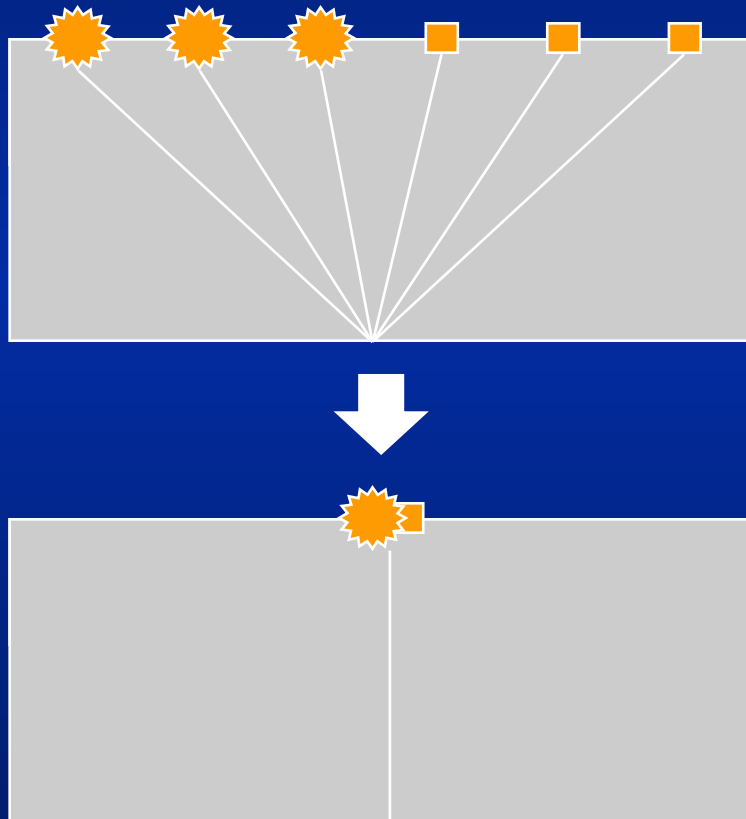
CMP gather

Demultiple

NMO correction

**DMO Correction**

How to reduce the  
number of traces?



## Processing Sequence

**Geometry definition**

**Static corrections**

**Amplitude recovery**

**Velocity filtering**

**Deconvolution**

**CMP gather**

**Demultiple**

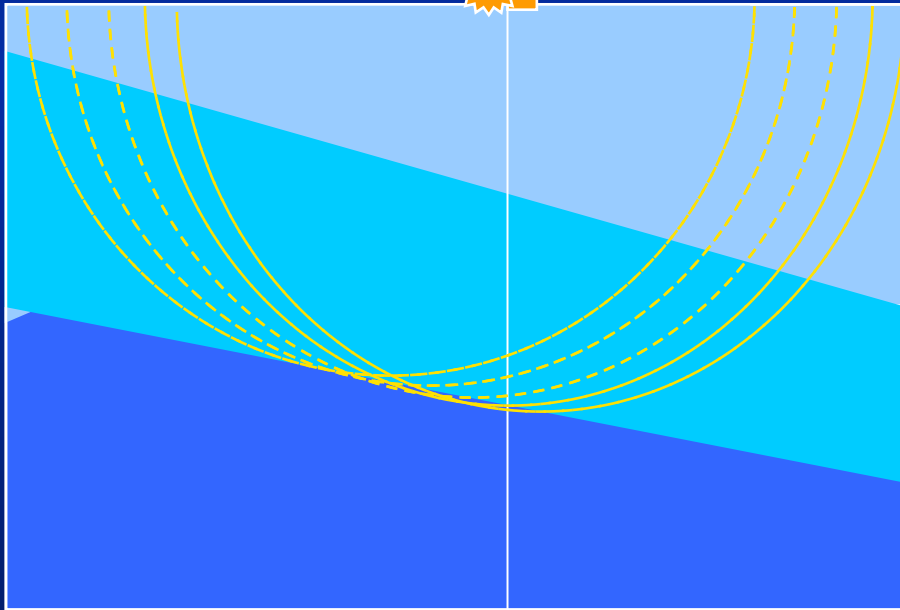
**NMO correction**

**DMO Correction**

**CMP stack**

Do the reflections all  
come from vertically  
below?

**midpoints**



## Processing Sequence

**Geometry definition**

**Static corrections**

**Amplitude recovery**

**Velocity filtering**

**Deconvolution**

**CMP gather**

**Demultiple**

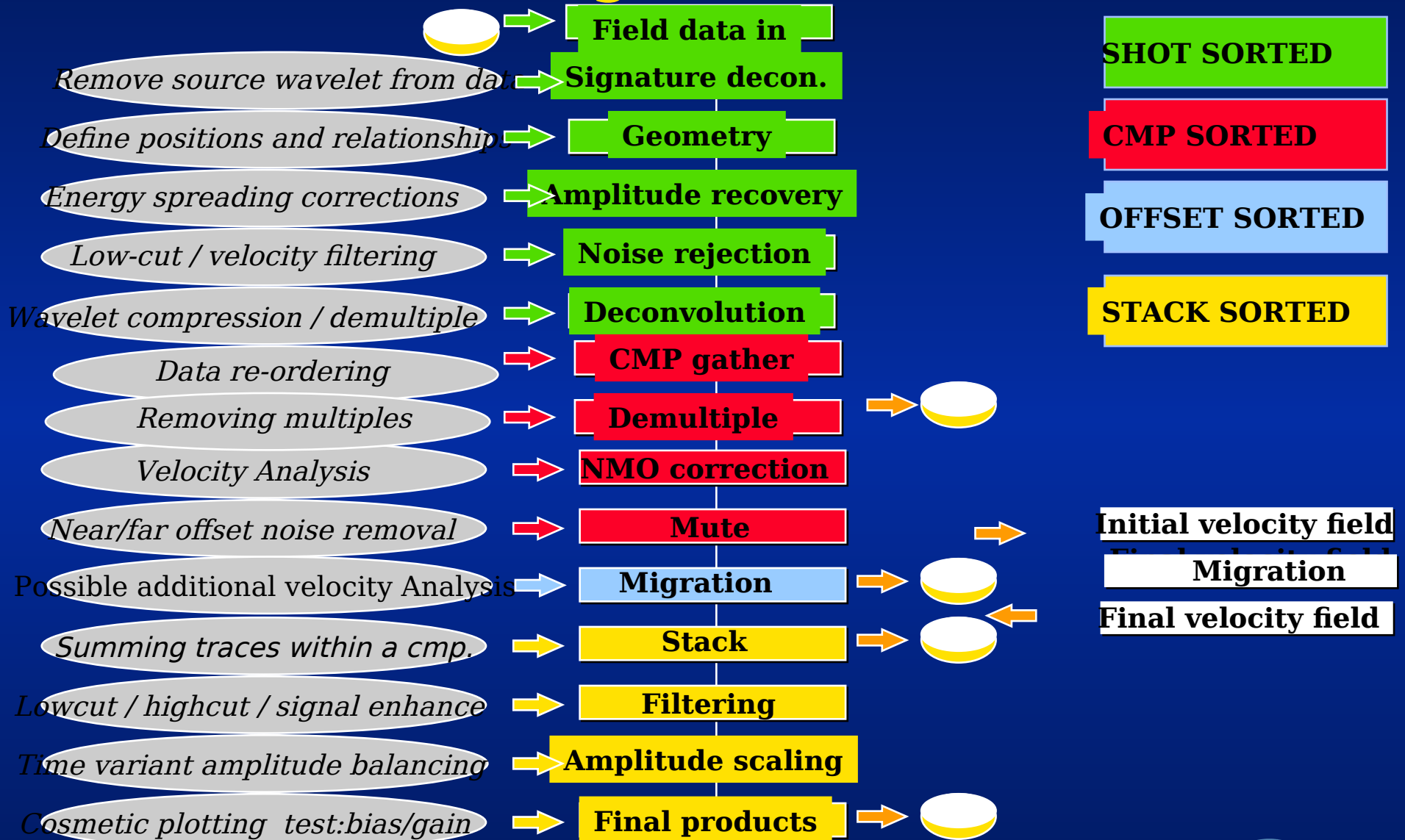
**NMO correction**

**DMO**

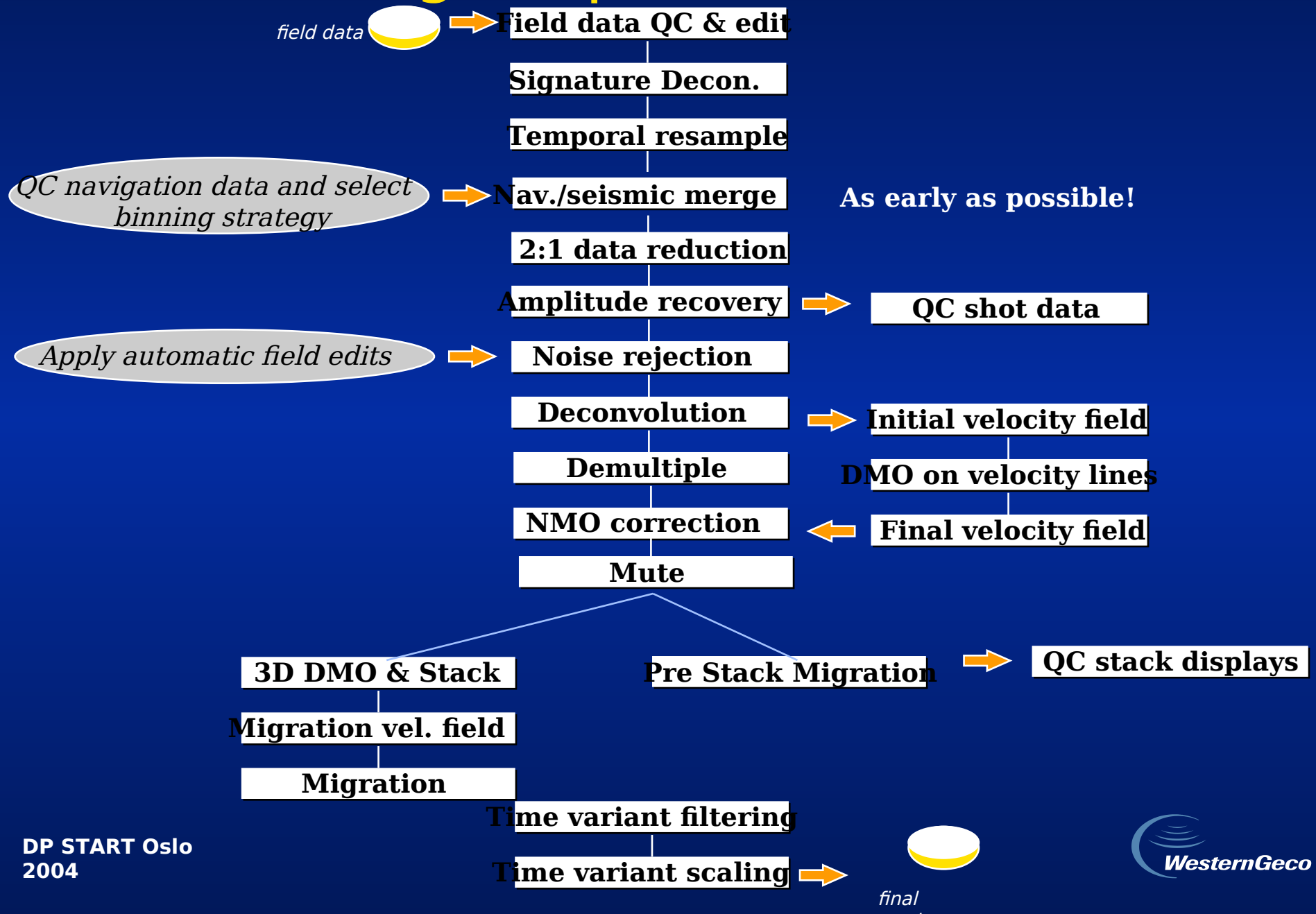
**Connection  
CMP stack**

**Migration**

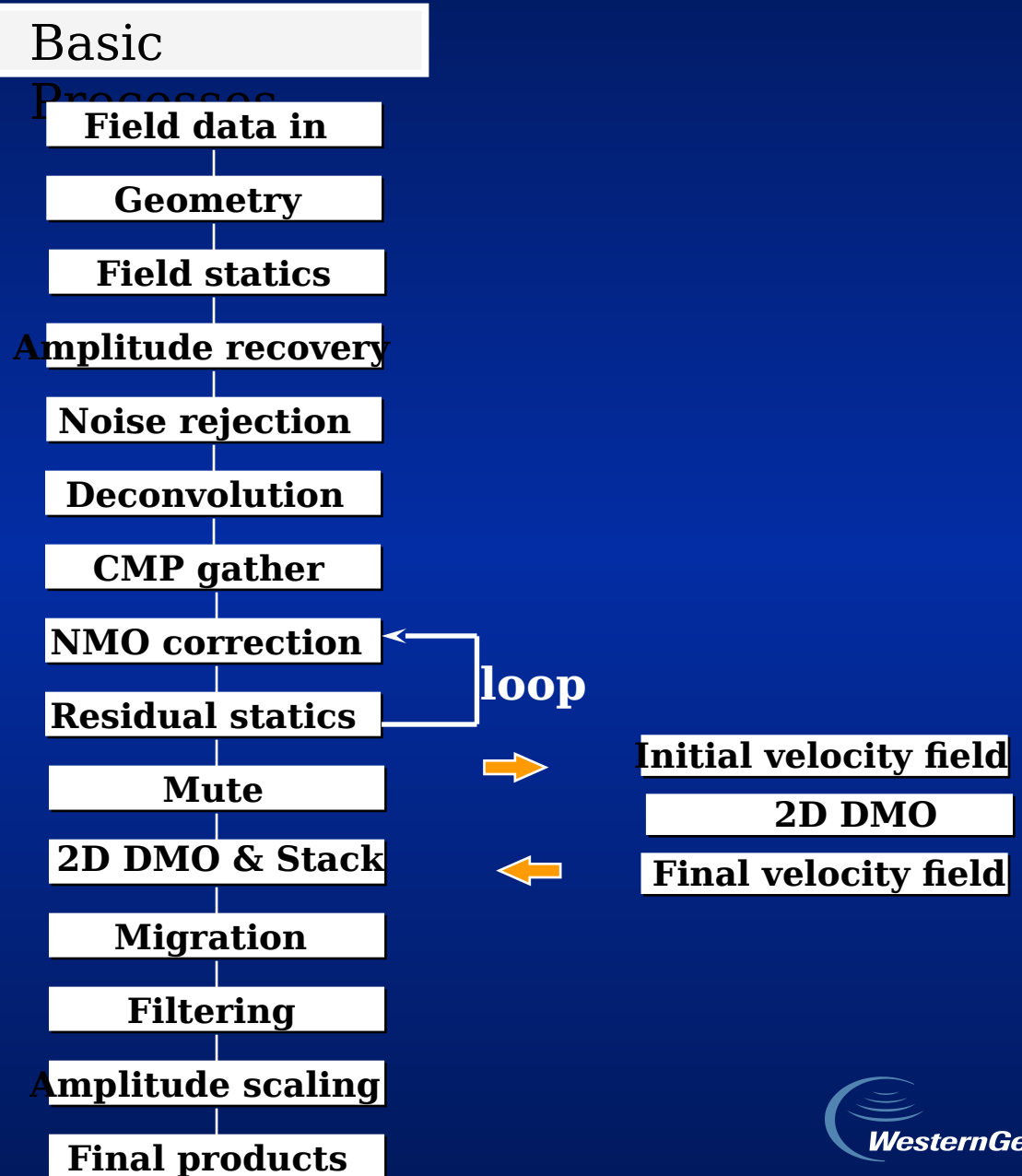
# Pre Stack migration (2D marine)



# Processing Sequence (3D marine)



# Processing Sequence (2D land)



# Summary

Usually all processing projects will require the following:

- Accurate locating of shots and receivers and their relationship
- Time-correction to a known datum
- Amplitude recovery
- Noise attenuation
- Signal enhancement
- Cmp gathering
- Remultiple
- Normal move-out correction (including muting any noise introduced)
- Residual time-corrections (land data)
- Correction for smearing within a cmp - dip-moveout correction
- Data reduction - stacking
- Repositioning / imaging - Migration